Original Article

MEDICINE PALLIATIVE CARE

DOI: 10.47582/jompac.1650399

J Med Palliat Care. 2025;6(3):213-218

Retrospective evaluation of oral health-related quality of life in patients after dental implant treatment

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Cite this article as: Topan C, Soylu E, Demirbaş AE, Yener B, Gayibov N. Retrospective evaluation of oral health-related quality of life in patients after dental implant treatment. *J Med Palliat Care*. 2025;6(3):213-218.

Received: 04.03.2025 • **Accepted**: 28.04.2025 • **Published**: 18.06.2025

ABSTRACT

Aims: The study aimed to evaluate oral health-related quality of life in patients long after dental implant treatment.

Methods: The study was carried out on patients who underwent dental implant surgery and completed prosthetic treatment at Erciyes University Faculty of Dentistry between 2009 and 2013. Oral health-related quality of life was evaluated by applying the OHIP-14 scale to the patients. The data obtained from the patients was compared in terms of age, gender, educational status, and prosthesis type.

Results: After 10–14 years of follow-up, the dental implant survival rate was 96.3%. There was no statistically significant difference between OHIP-14 scores according to gender and educational status ($p>0.05$). It was determined that individuals between the ages of 18 and 50 were statistically more advantageous than individuals between the ages of 51 and 73 in terms of functional limitation and physical pain subcategories ($p<0.05$). Patients using implant-supported fixed prostheses were found to have higher satisfaction levels in terms of quality of life compared to patients using implant-supported removable prostheses ($p<0.05$). The type of removable prosthesis was determined to be responsible for 15% of the change in the total OHIP-14 score ($p<0.05$).

Conclusion: Among patients with a long-term follow-up, the survival rate of dental implants was 96.3%. Individuals aged 51-73 years may be more prone to physical pain and functional limitations compared to individuals aged 18-50 years after dental implant therapy. The oral health-related quality of life was shown to be higher in individuals with implant-supported fixed prostheses than in those with removable prostheses.

Keywords: Dental implant, OHIP-14, oral health, quality of life

INTRODUCTION

Dental implants have been used successfully and predictably for decades to restore function and aesthetics in partially or completely edentulous patients. However, some complications may occur with this treatment method. The loss of dental implants is one of these problems.[1-3] Dental implant loss is defined as the implant moving for a variety of reasons following osseointegration. In other words, the inability to start and continue osseointegration in the host tissue is dental implant loss and includes many clinical problems.[4-6] According to studies in the literature, between 90% and 98% of dental implants survive after a follow-up of 10 years.[7] The aforementioned factors include biological and physiological characteristics (aesthetics, phonation, and function), longevity and survival (natural teeth, restorations, and implants), psychological and social characteristics of patients (personal satisfaction, quality of life, perception of body image), and financial and economic aspects associated with the course of treatment. Although studies have focused primarily on the first two categories, psychosocial characteristics have drawn increasing attention from researchers recently.[8-11] Improving patients' quality of life is typically the goal of edentulism rehabilitation. When assessing the effectiveness of dental therapy, subjective perceptions of the patient's comfort, social standing, and psychosocial state should not be neglected.[12]

The term "quality of life" is a broad concept. The study of oral health-related quality of life (OHRQoL) focuses on how an individual's perception of function, level of physical and psychological discomfort, and general well-being are affected by their dental health. An assessment of OHRQoL is useful in the treatment of patients with complete or partial tooth loss. This is because tooth loss causes serious problems for patients' diet, social life, and daily life in general, which in turn causes functional, cosmetic, and psychological issue.[13-17] Clinical trials have long used the Oral Health Impact Profile Index (OHIP-14), a 14-question questionnaire, as a reliable method to measure OHRQoL.[14,18-21]

The literature includes various studies that evaluate the OHRQoL in patients following dental implant treatment. Nevertheless, the majority of these investigations focused

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on data provided shortly after treatment.[8,22,23] There isn't much research investigating OHRQoL in this scenario long after dental implant treatment.[13] The present study analyzed participants who were followed up at least 10 years after treatment to evaluate the long-term effects of dental implant treatment. The study aimed to evaluate the OHRQoL in patients long after dental implant treatment.

METHODS

The research protocol was approved by the Clinical Researches Ethics Committee at the Erciyes University (Date: 10.07.2024, Decision No: 2024/81). The Declaration of Helsinki Principles were followed in the conduct of the study. Patients with tooth loss in the upper or lower jaw who underwent dental implant surgery and completed prosthetic treatment at Erciyes University Faculty of Dentistry between 2009 and 2013 were the subjects of the study. The study included patients who did not use any medicine that affects bone metabolism, such as denasumab, glucocorticoids, bisphosphonates, or osteopetrosis, or who did not have any bone metabolism diseases, such as fibrous dysplasia, hyperparathyroidism, or Paget's disease. Patients who had previously received chemotherapy or radiation therapy, as well as those excluded from the study if they refused to complete the questionnaire.

Participants did not sign a written informed consent form because the study was designed retrospectively. Patients who had received dental implant treatment for a minimum of ten years were invited to the clinic for a routine follow-up visit. Each participant underwent an intraoral clinical examination and radiographic evaluation; outcomes were recorded in the patient files. These files included information about the demographic characteristics of the patients and the number of lost dental implants. The demographic characteristics of the participants include age, gender, educational status, and type of prosthesis. To evaluate their OHRQoL, all participants were requested to fill out the OHIP-14-TR quality of life questionnaire, which is the Turkish version of the OHIP-14 scale. In the study of Başol et al.,[24] it was found that OHIP-14-TR was reliable (Cronbach's Alpha: 0.74), reproducible (r: 0.932), valid, and understandable (96.2%) in Turkish translation. The Cronbach's alpha value of this study was calculated as 0.819. The 14 items that comprise the OHIP-14-TR are divided into seven domains, each with two questions: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. A 5-point Likert scale was used to rate the patients' survey responses: never (score 0), rarely (score 1), occasionally (score 2), rather often (score 3), and very often (score 4).[24] Inadequate OHRQoL is demonstrated by high OHIP-14 scores, whereas proper and satisfactory OHRQoL is represented by low OHIP-14 scores. All participant information was documented in the patient files and utilized in the present study. The data obtained from the patients were compared regarding age, gender, educational status, and prosthesis type.

Statistical Analysis

The data from the research were investigated with the SPSS 21.0 package (IBM Corp., Armonk, NY, USA). The Shapiro-Wilk test was used to determine whether the study's numerical data were suitable for a normal distribution. Independent Sample T-test, One-Way Anova test, and regression analyses were performed on the data suitable for normal distribution. The significance level was determined at $p<0.05$, and the results were assessed at a 95% confidence range.

RESULTS

Of the 270 patients who met the study criteria, 141 were female, 129 were male, and the mean age was 49.59±10.29 years. Participants' educational backgrounds were 34.8% with a primary education, 22.6% with a high school education, and 42.6% with a university degree. 78.9% of the patients used implant-supported fixed prostheses, while 21.1% used implant-supported removable prostheses. The demographic data of the patients is demonstrated in Table 1. The 270 individuals in the research received a total of 891 dental implants. After 10–14 years of follow-up, the overall implant survival rate was 96.3%.

Table 1. Demographic characteristics of patients

Demographic characteristics	n	%
Mean age (x±SD)	49.59±10.29	
Gender		
Female	141	52.2
Male	129	47.8
Education level		
Primary education	94	34.8
High school	61	22.6
Undergraduate	115	42.6
Prosthesis type		
Fixed	213	78.9
Removable	57	21.1

SD: Standart deviation

The OHIP-14 scale questions and the percentage distribution of patients' answers to these questions are shown in Table 2. The mean total OHIP-14 scale score of the participants was 5.31±6.40. When the OHIP-14 sub-dimension total mean scores of the patients were examined, the highest score (1.68±1.99) was obtained from the psychological discomfort category and the lowest score (0.32±0.85) was obtained from the psychological disability category. The responses of the patients to the OHIP-14 scale are shown in Table 3.

The mean scores for the OHIP-14 sub-dimension and total were compared based on the patients' descriptive features. The OHIP-14 scores did not differ statistically significantly based on the patient's gender or level of education ($p>0.05$). Patients aged 18-50 and patients aged 51-73 differed statistically significantly in the functional limitation and physical pain subcategories, favoring the patients aged 18-50 ($p=0.000$ and $p=0.038$, respectively). This shows that patients aged 51-73 years were less satisfied with their quality of life in terms of functional limitations and physical pain than the patients aged 18-50 years. The mean OHIP-14 total score of patients using implant-supported fixed prostheses was statistically lower than that of patients using implant-supported removable prostheses ($p=0.014$). The mean scores on the OHIP-14 subscale were compared based on the patients' prosthesis type. The subcategories of functional limitation, physical pain, physical disability, and social disability were

Table 2. Oral Health Impact Profile (OHIP-14) –questionnaire and the percentage distribution of answers

		(%)	(%)	(%)	(%)	(%)	Mean±SD
Dimension	**Variables**	**0**	**1**	**2**	**3**	**4**	
Functional limitation	1-Have you had trouble pronouncing any words because of problems with your teeth, mouth, or dentures?	81.1	7.4	8.9	2.2	0.4	0.33±0.762
	2-Have you felt that your sense of taste has worsened because of problems with your teeth, mouth, or dentures?	84.1	10.4	3.3	0.7	1.5	0.26±0.715
Physical pain	3-Have you had painful aching in your mouth?	60.7	20.0	14.8	3.0	1.5	064±0.940
	4-Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth, or dentures?	77.4	10.4	7.0	1.5	3.7	0.44±0.961
Psychological discomfort	5-Have you been self-conscious because of your teeth, mouth, or dentures?	54.1	10.7	9.3	15.9	10	1.17±1.474
	6-Have you felt tense because of problems with your teeth, mouth, or dentures?	71.9	10.7	13.3	2.2	1.9	0.51±0.936
Physical disability	7-Has your diet been unsatisfactory because of problems with your teeth, mouth, or dentures?	80.7	7.0	7.4	2.6	2.2	0.39±0.900
	8-Have you had to interrupt meals because of problems with your teeth, mouth, or dentures?	86.3	6.7	5.2	1.1	0.7	0.23±0663
Psychological disability	9-Have you found it difficult to relax because of problems with your teeth, mouth, or dentures?	77.4	9.6	7.8	1.9	3.3	0.44±0.957
	10-Have you been a bit embarrassed because of problems with your teeth, mouth, or dentures?	87.4	6.3	4.1	0.7	1.5	0.23±0.693
Social disability	11-Have you been a bit irritable with other people because of problems with your teeth, mouth, or dentures?	91.1	5.2	3.3	0.4	0	0.13±0.450
	12-Have you been a bit irritable with other people because of problems with your teeth, mouth, or dentures?	87.4	8.1	3.0	0.7	0.7	0.19±0591
Handicap	13-Have you felt that life in general was less satisfying because of problems with your teeth, mouth, or dentures?	86.3	8.1	3.7	1.5	0.4	0.21±0.614
	14-Have you been totally unable to function because of problems with your teeth, mouth, or dentures?	92.6	3.7	2.2	0.7	0.8	0.14±0.572

Never (=0), Hardly ever (=1), Occasionally (=2), Fairly often (=3) and Very often (=4)

SD: Standart deviation

Table 3. OHIP-14 total mean scores and OHIP-14 domains total mean scores

OHIP-14 domain	Mean±SD	Median (min-max)
Functional limitation	0.58±1.15	0.00 (0.00-7.00)
Physical pain	1.08±1.50	0.00 (0.00-8.00)
Psychological discomfort	1.68±1.99	1.00 (0.00-8.00)
Physical disability	0.61±1.30	0.00 (0.00-7.00)
Psychological disability	0.32±0.85	0.00 (0.00-6.00)
Social disability	0.66±1.33	0.00 (0.00-8.00)
Handicap	0.35±1.01	0.00 (0.00-8.00)
Total	5.31±6.40	0.00 (0.00-40.00)

OHIP-14: Oral Health Impact Profile, SD: Standard deviation, Min: Minimum, Max: Maximum

shown to have statistically significant differences in favor of fixed prosthesis users (p=0.017, p=0.000, p=0.001, p=0.000, respectively). This suggests that patients with fixed prostheses supported by implants are more satisfied with their quality of life than those with removable prostheses supported by implants (Table 4).

A linear regression analysis was performed for the type of prosthesis used by the patients and the mean total score of the OHIP-14 scale. A statistical significance was determined in the regression model ($p<0.05$; $R^2=0.023$). Based on the statistical analysis results, the prosthesis type proved to be the most effective factor for OHIP-14 ($\beta=0.150$, $p<0.05$). The type of prosthesis was found to be responsible for 15% of the change in the OHIP-14 total score (Table 5).

DISCUSSION

The present study assessed the long-term survival rate of dental implants and the OHRQoL in patients using the OHIP-14 scale. The study's results revealed that the patient's age and the type of prosthesis affect the quality of life related to oral health. Additionally, patients between the ages of 18 and 50 were less likely to experience physical jaw pain and limitations in function than patients between the ages of 51 and 73. The quality of life associated with oral health was higher for patients with implant-supported fixed prostheses than those with implant-supported removable prostheses.

For many years, dental implants have been utilized for treating complete or partial tooth loss with great success. However, in some cases, patients may experience complications, including the loss of dental implants.[1] Therefore, practitioners must have reliable information about the long-term complications and survival rates of dental implant treatment when informing patients about the therapy before the procedure.[25] Balshi et al.[2] reported that the survival rate of dental implants placed in the total or partially edentulous lower jaw and followed up for at least 10 years was 92.7%. According to Becker et al.,[7] 88.03% of dental implants survived during a long-term follow-up

Table 4. Comparison of OHIP-14 total and OHIP-14 domain mean scores according to the descriptive characteristics of the patients

Descriptive characteristics	Functional limitation mean±SD	Physical pain mean±SD	Psychological discomfort mean±SD	Physical disability mean±SD	Psychological disability mean±SD	Social disability mean±SD	Handicap mean±SD	OHIP total mean±SD
Gender								
Female	0.49±1.04	1.16±1.60	1.73±2.02	0.66±1.39	0.35±0.86	0.72±1.45	0.42±1.20	5.55±6.67
Male	0.68±1.25	0.98±1.39	1.64±1.97	0.57±1.22	0.29±0.84	0.61±1.19	0.27±0.77	5.07±6.15
p*	0.168	0.330	0.722	0.559	0.612	0.525	0.214	0.543
Age								
18-50	0.59±1.07	1.00±1.36	1.82±2.15	0.48±1.19	0.35±0.92	0.70±1.42	0.32±1.00	5.30±6.14
51-73	3.33±2.88	2.66±0.57	2.66±2.30	1.33±1.15	0.00±0.00	1.00±1.73	1.33±1.52	12.33±4.72
p*	0.000	0.038	0.508	0.226	0.507	0.725	0.093	0.052
Education level								
Primary education	0.68±1.32	1.37±1.75	1.54±1.92	0.68±1.38	0.39±0.93	0.80±1.40	0.32±0.92	5.80±6.70
High school	0.65±1.26	0.90±1.20	1.60±1.80	0.70±1.37	0.34±0.70	0.62±1.18	0.32±0.94	5.16±5.35
Undergraduate	0.47±0.91	0.93±1.40	1.85±2.14	0.52±1.20	0.25±0.85	0.57±1.35	0.35±1.01	5.00±6.69
p**	0.395	0.067	0.502	0.576	0.479	0.432	0.913	0.649
Prosthesis type								
Fixed	0.50±1.03	0.91±1.29	1.75±2.03	0.48±1.16	0.31±0.83	0.51±1.18	0.33±1.01	4.82±5.77
Removable	0.91±1.49	1.71±2.00	1.43±1.82	1.12±1.65	0.35±0.91	1.22±1.66	0.40±1.33	7.17±8.15
p*	0.017	0.000	0.286	0.001	0.775	0.000	0.666	0.014

OHIP-14: Oral Health Impact Profile, SD: Standard deviation

Table 5. The effect of some independent variables on OHIP-14 total score: multiple linear regression analysis

Independent variables	B †	SE †	β †	t	p	95% CI †
Prosthesis type	2.354	0.947	0.150	2.487	0.014*	0.490 to 4.217

†: B, non-standardised regression coefficient, SE: Standard error, β: Standardised regression coefficient, CI: Confidence interval, R^2=0.023 , t: Test statistic , * tested by linear regression analysis. A significance level was taken as p<0.05.

period of 12 to 23 years. In a study by Adler et al.[25] with a follow-up of 9-15 years, the dental implant survival rate was 82.6%, and in a study by Simonis et al.[26] with a follow-up of up to 16 years, this rate was 82.94%. According to meta-analysis research published in the literature, 96.4% of dental implants with a 10-year follow-up survived.[27] In the present study, the survival rate of dental implants followed up for 10–14 years was found to be 96.3%. In this sense, the findings of our study were found to be compatible with the results of similar studies in the literature.

Studies on dental implants have generally focused on their biological success or failure. However, there is a limited number of investigations in the literature evaluating treatment outcomes based on patient perceptions. Moreover, some researchers have argued that treatment success should be evaluated by individual patients instead of using traditional clinical evaluation methods. In this way, OHQoL assessments allow patients to assess the outcomes of dental treatments on an individual basis.[12,20] Bramanti et al.[8] investigated the physical and psychological influences of implant-supported fixed partial denture treatment on edentulous patients. For this purpose, they assessed oral health-related quality of life in patients before and after prosthetic implant therapy. At the end of the study, the authors concluded that dental implant treatment had a positive effect on OHRQoL.[8] A study by Yoo et al.[23] investigated the effect of dental implant treatment on OHRQoL in edentulous individuals with disabilities using the OHIP-14 questionnaire. The researchers reported that dental implant treatment contributed positively to the improvement of OHRQoL for disabled patients, and OHRQoL decreased with age for patients with similar levels of disability.[23] When participants' responses to the OHIP-14 scale were analyzed in the present research, it was discovered that patients aged 51-73 years had a lower oral health-related quality of life than patients aged 18-50 years.

Coltro et al.[13] evaluated the effect of implant-supported fixed prosthesis treatment on patients' OHRQoL in a prospective clinical study. At the end of the study, the researchers reported that dental implant treatment had a positive long-term effect on patients' OHRQoL.[13] Kuoppala et al.[19] assessed the OHRQoL of patients treated with implant-supported mandibular overdenture prostheses. Within the scope of the study, they investigated the relationships between OHIP-14 variables and the age and gender of the patients. They found that elderly patients using implant-supported mandibular overdenture prostheses were more satisfied with OHRQoL compared to younger patients.[19] However, contrary to the findings of Kuoppala et al.,[19] our study results revealed that the likelihood of patients experiencing functional limitation and physical pain in the jaws may increase with the increasing age of the participants.

Gecikli et al.[20] researched whether patients' quality of life was affected by overdenture prosthesis treatment supported by dental implants. To achieve this, they administered the UK oral health-related quality of life (OHQoL-UK) and the Turkish versions of OHIP-14 to the patients both before and

after treatment. They found significant decreases in the OHIP-14 scores of the patients at the end of therapy compared to the pretreatment scores. They discovered that for both the OHIP-14 and OHQoL-UK scores, the patient's gender was a non-significant pre-treatment variable. The authors reached the view that patients' quality of life significantly improved when implant-retained overdenture prostheses were rehabilitated in the mandible.[20] Değirmenci et al.[22] evaluated the effects of removable partial dentures (RPD) on the quality of life of patients. According to the authors, OHIP-14 scores were not influenced by the patient's gender, level of education, or oral hygiene practices. At the end of the study, they found that patients with RPD in both jaws were more likely to experience physical pain and functional limitation problems than patients with RPD in one jaw.[22] In our study, we determined that gender and educational status had no effect on patients' oral health-related quality of life. However, patients using implant-supported fixed prosthesis were found to be more advantageous than patients using implant-supported removable prosthesis in terms of functional limitation and physical pain.

Limitations

The study has some limitations. Firstly, due to the retrospective nature of the study, oral health-related quality of life could not be evaluated in patients before dental implant treatment. The second limitation is that the periodontal health status and oral hygiene motivation levels of the participants were not standardized. Finally, systemic diseases of the participants and their effects on dental implants were not assessed. Further randomized controlled clinical trials evaluating the participants according to their systemic diseases will provide more precise results.

CONCLUSION

As a result, the survival rate of dental implants was found to be 96.3% in patients with a long-term follow-up of 10–14 years. Patients aged 51-73 years may be more likely to experience functional limitations and physical pain in their jaws. Patients using implant-supported fixed prostheses had a higher oral health-related quality of life compared to patients using implant-supported removable prostheses. Pre-treatment assessment of the individuals' OHQoL assists the physician with creating therapy predictions and identifying the most efficient treatment strategy that fulfills the patient's expectations.

ETHICAL DECLARATIONS

Ethics Committee Approval

The research protocol was approved by the Clinical Researches Ethics Committee at the Erciyes University (Date: 10.07.2024, Decision No: 2024/81).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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